

NRNU “MEPHI”

**SPATIAL CHARACTERISTICS OF HIGH ENERGY
ELECTRON AND POSITRON FLUXES
OF SECONDARY ORIGIN IN THE NEAR EARTH
SPACE**

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On behavior PAMELA collaboration*

Задачи,

для решения которых необходима детальная информация по потокам вторичных заряженных частиц в околоземном космическом пространстве

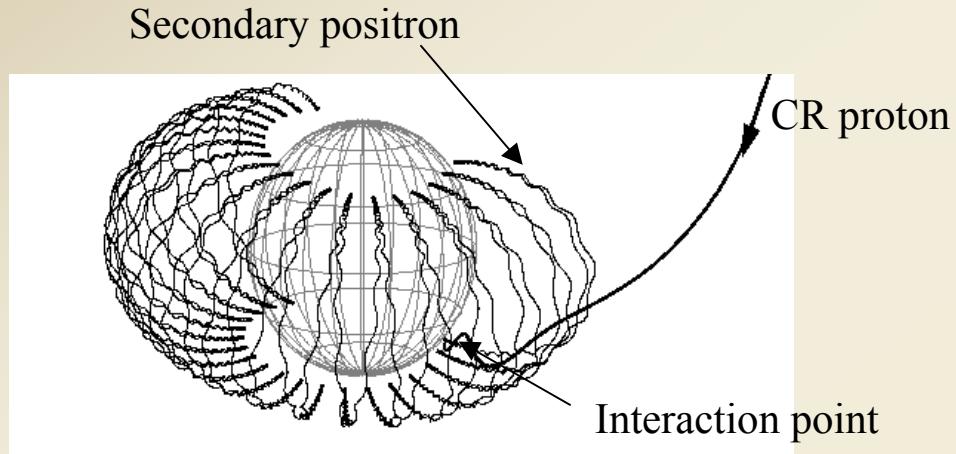
Научные:

изучение процессов генерации и распространения потоков частиц в околоземном космическом пространстве

Прикладные:

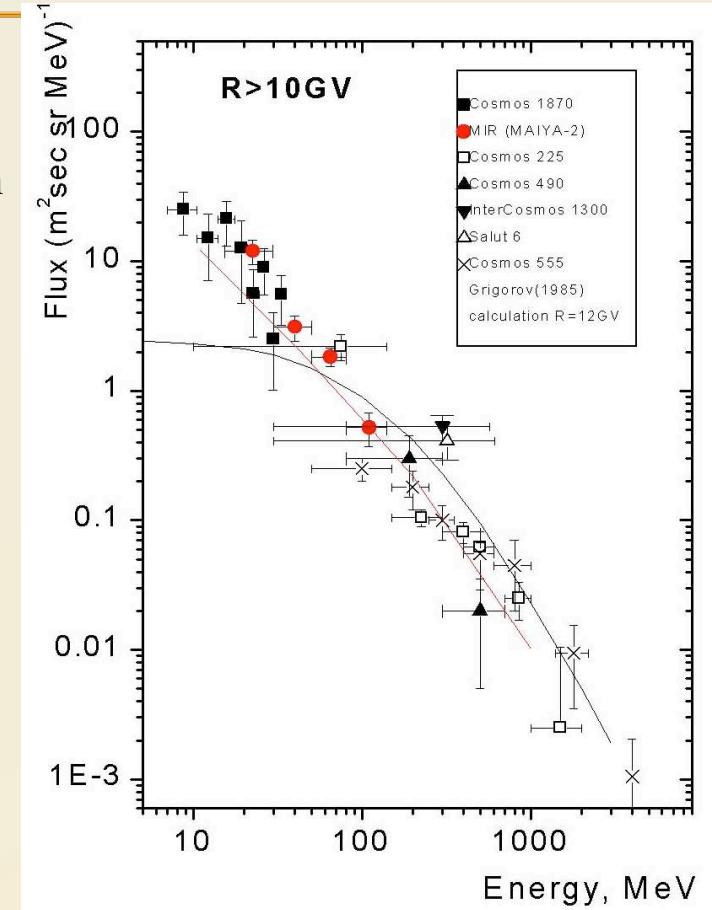
оценка радиационной обстановки при разработке аппаратуры для искусственных спутников Земли

Model of secondary production and results of old experiments



Intensity $\sim \rho(h) \cdot T \sim \rho \cdot 1/\rho \approx \text{constant}$

- Production of charged pions in CR protons interaction with residual atmosphere
- $\pi^\pm \rightarrow \mu^\pm \rightarrow e^\pm$ и $\pi^0 \rightarrow 2\gamma \rightarrow e^+ + e^-$
- Trapping of secondary particles

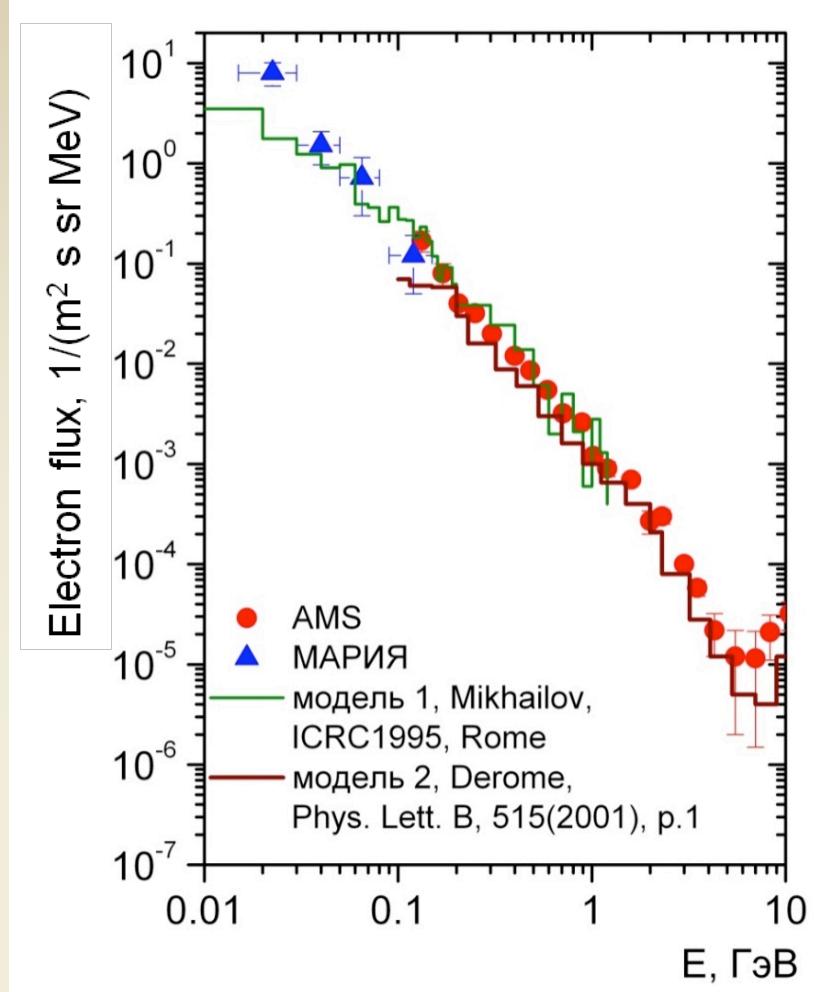


Total electron & positron flux measured in equatorial region before ~ 1990

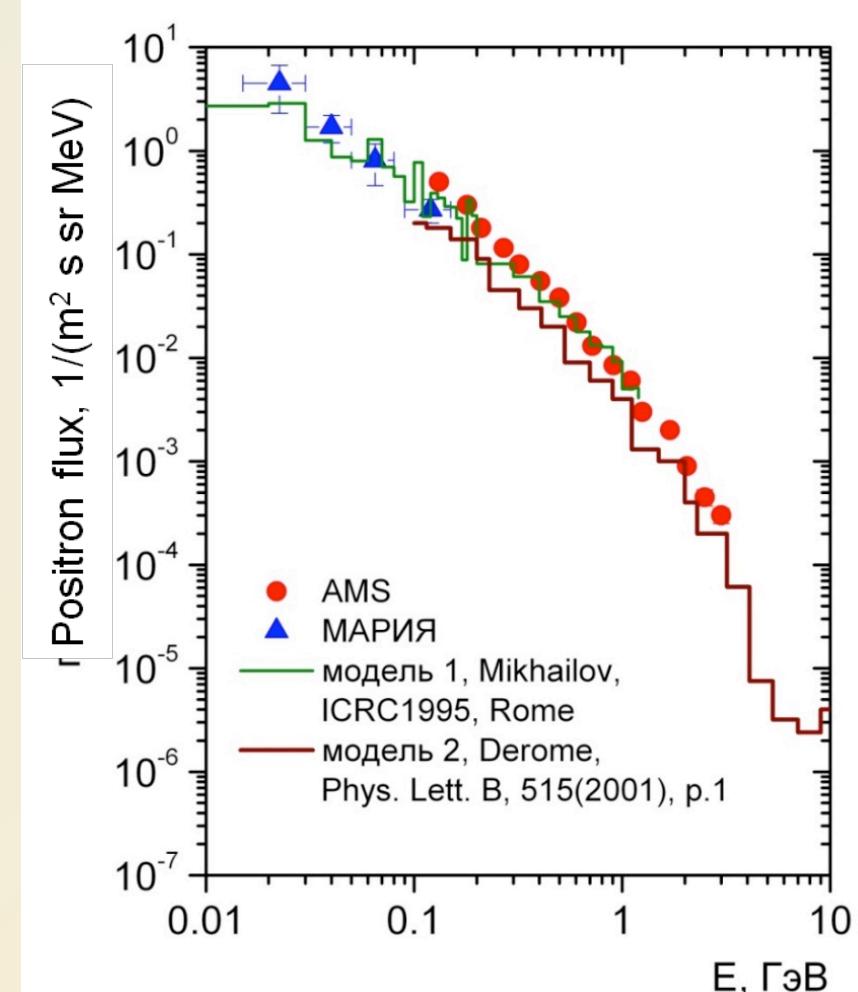
N. Grigorov

Possibility of existence of a radiation belt around the earth consisting of electr. ons with energies of 100 MeV and above.
Soviet Physics Doklady, Vol. 22, p.305 , 1977

Comparison of models with AMS data

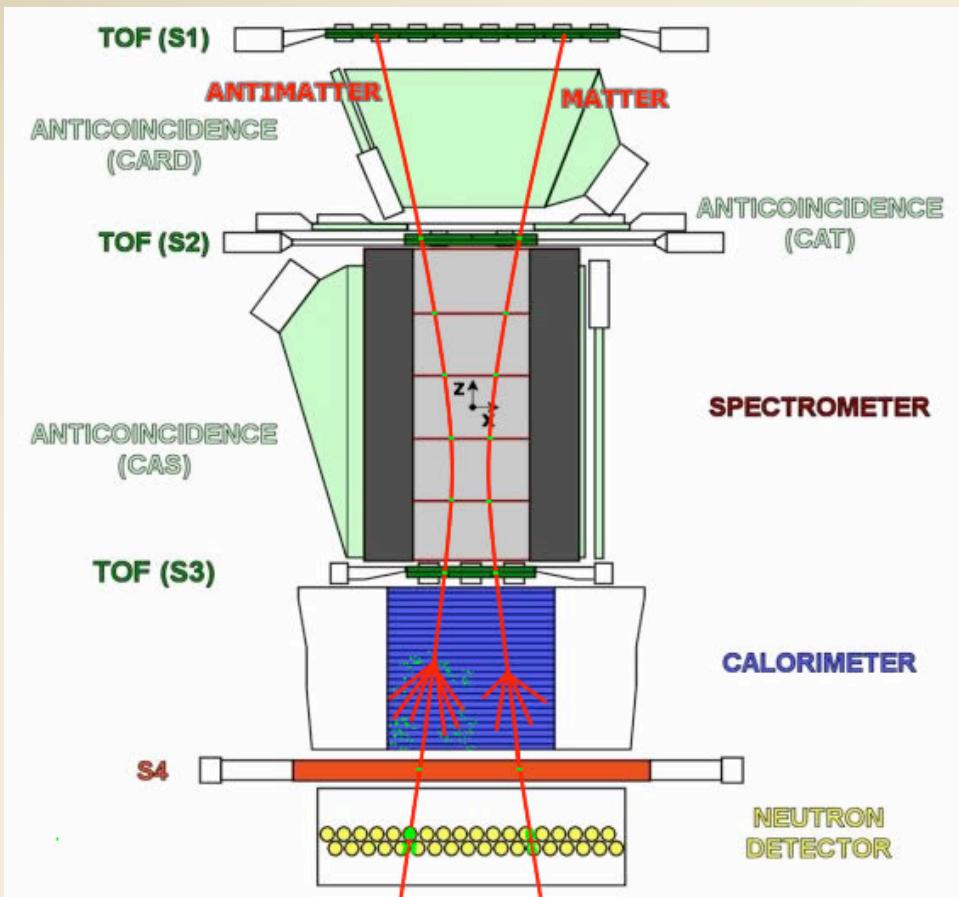


electrons



positrons

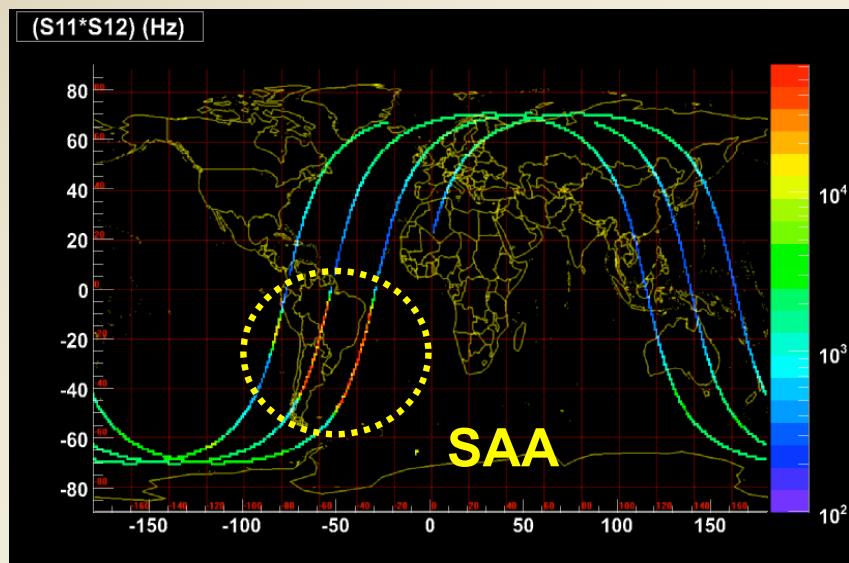
PAMELA instrument



Main object is detail investigation
of energy spectra antiparticles in
cosmic rays in energy interval
50 MeV – 300 GeV

Geomfactor= $21.6 \text{ cm}^2\text{sr}$

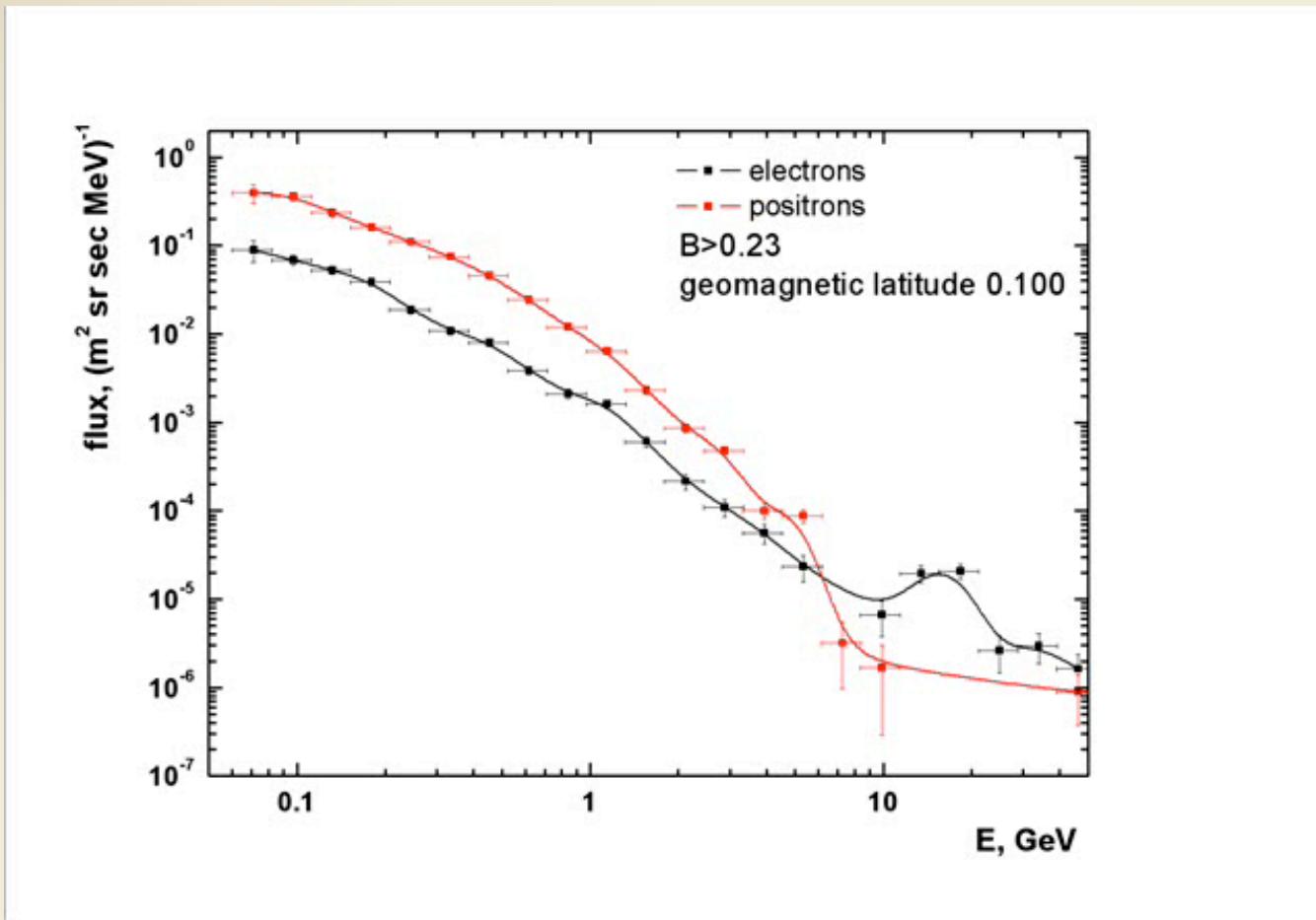
PAMELA & Arina experiments



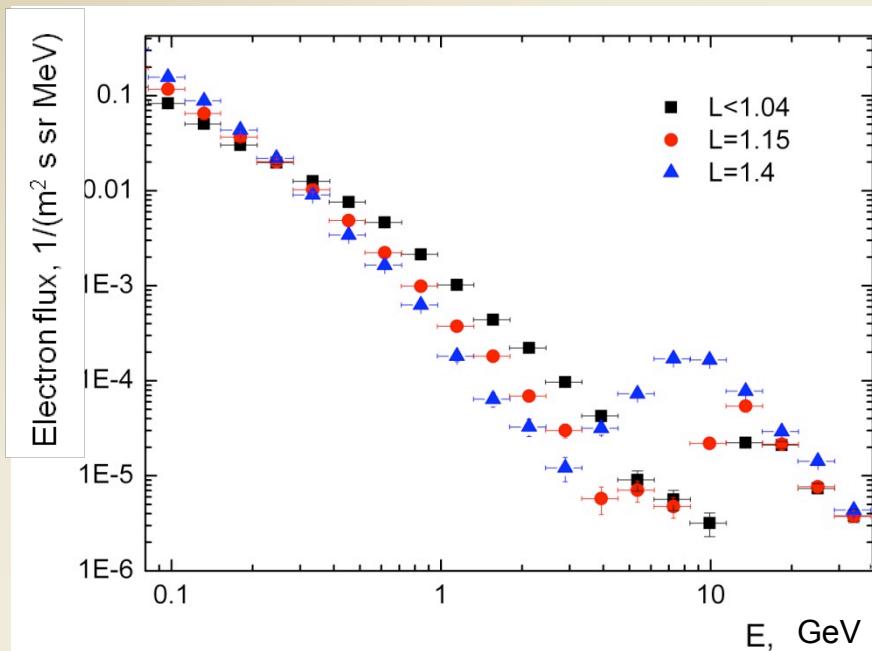
Counting rate along the satellite orbit

1. Resurs DK orbit is elliptical with inclination , 70° , altitude 350-600 km.
2. the instrument is pointed to zenith
3. Attitude information fixed every 30 sec.
4. For every event geographic and geomagnetic coordinates are calculated
5. Pitch-angle of events calculated using IGRF model
6. SAA region was excluded from data analysis ($B < 0.23$ G)

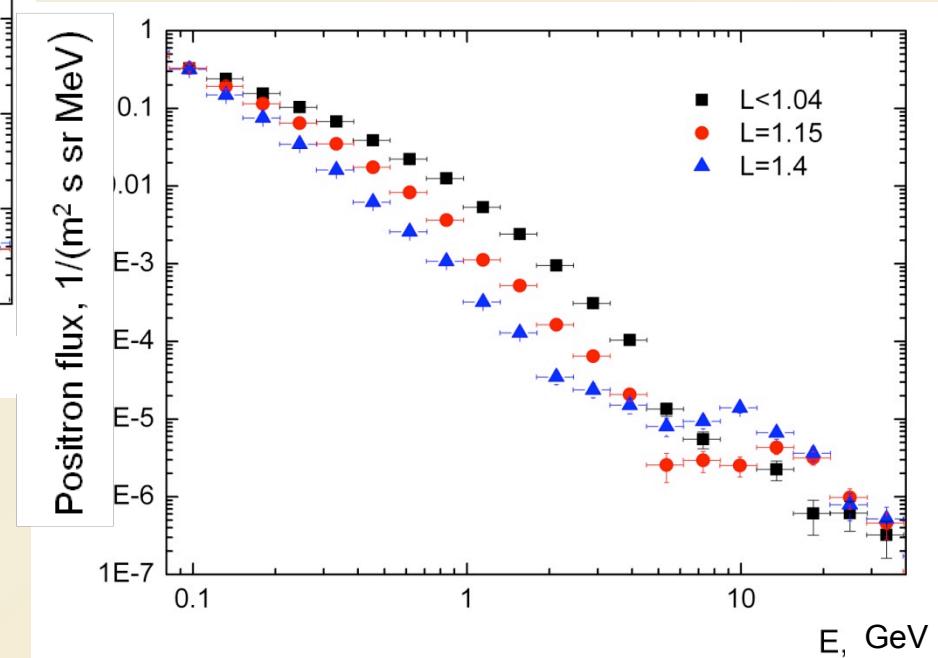
Latitudinal behavior of electron/positron spectra (I)



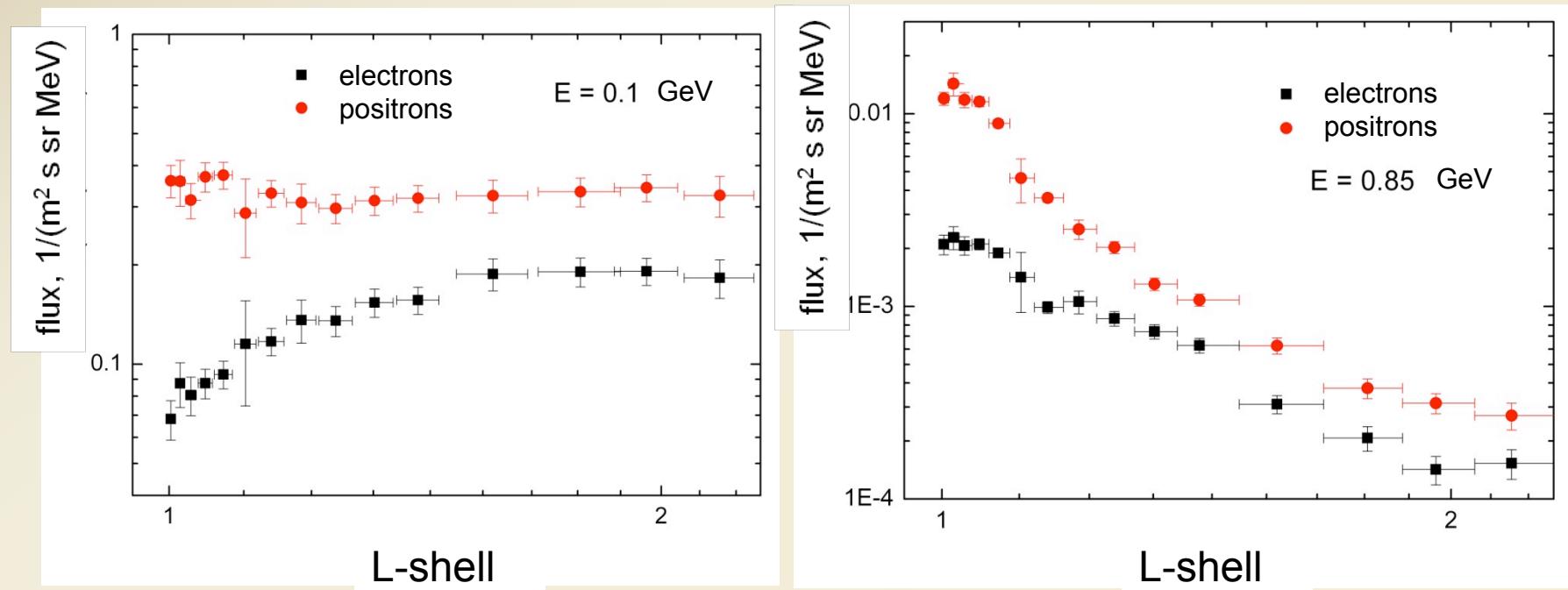
Latitudinal behavior of electron/positron spectra (II)



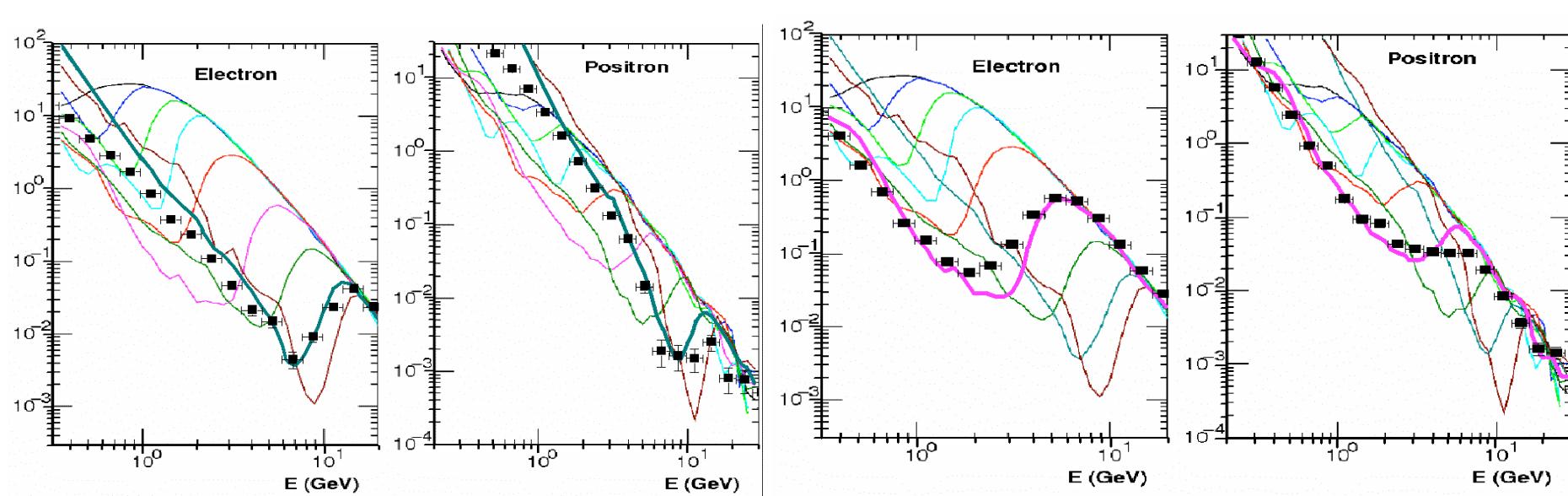
Electrons



Latitudinal behavior of electron/positron spectra (III)

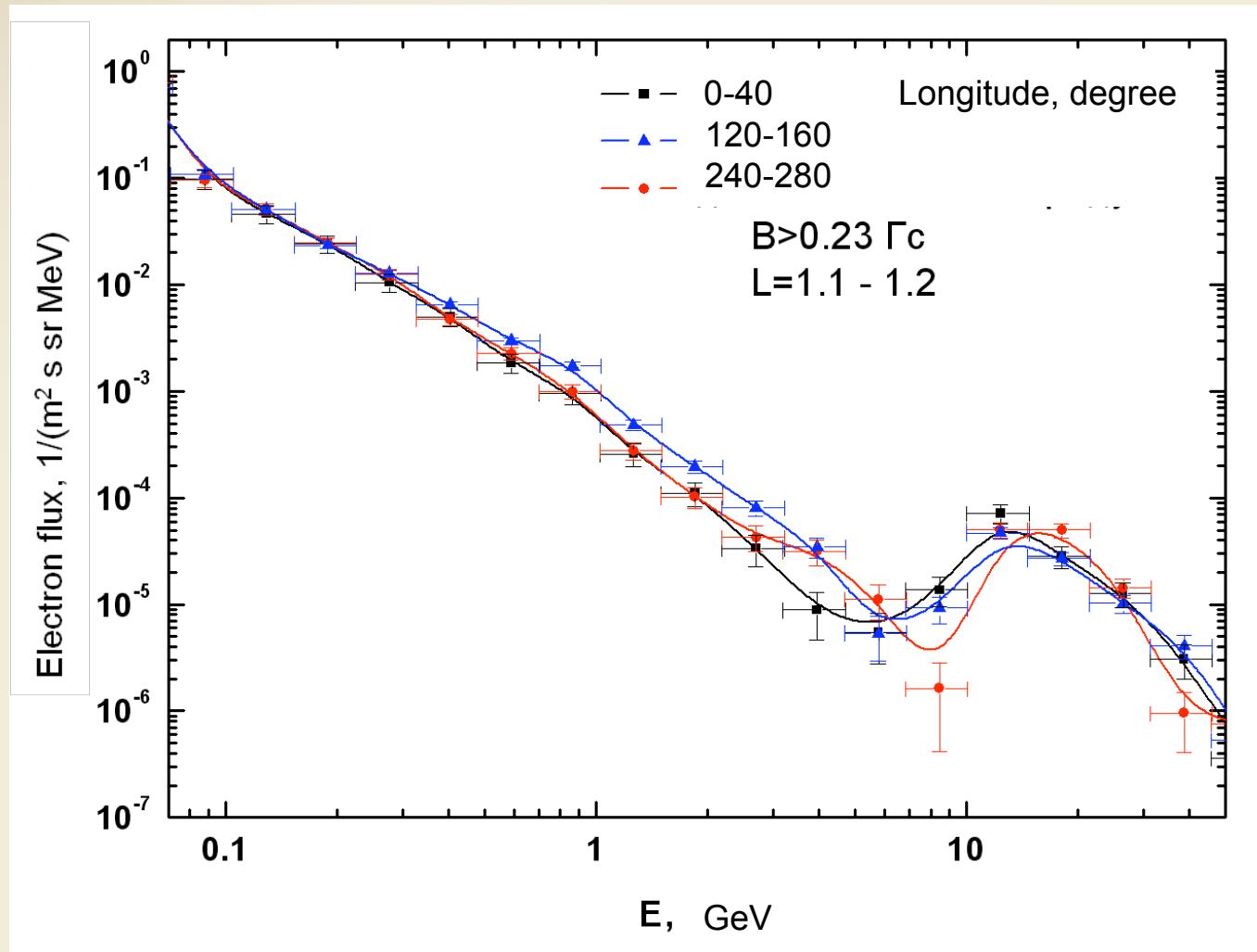


Calculated Energy spectra at 550km for vertical cut-off
0 – 0.6, 0.6 - 1, 1 – 1.5, 1.5 - 2, 2 – 4, 4 – 7, 7 – 10, 10 – 14 GV

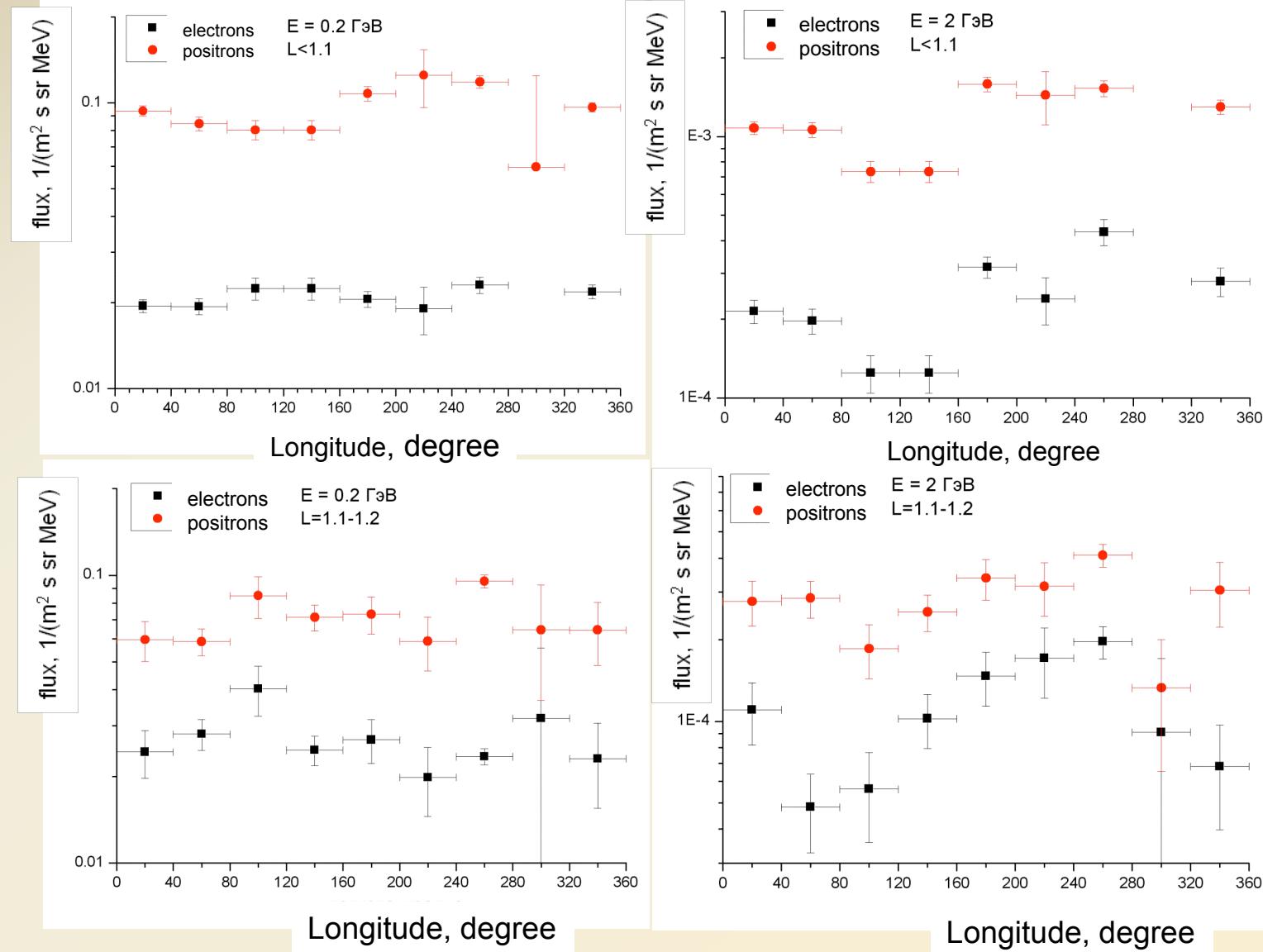


http://pamela.roma2.infn.it/workshop09/slides_WS2009/Honda.pdf

Longitudinal behavior of electron spectrum



Longitudinal behavior electrons and positrons

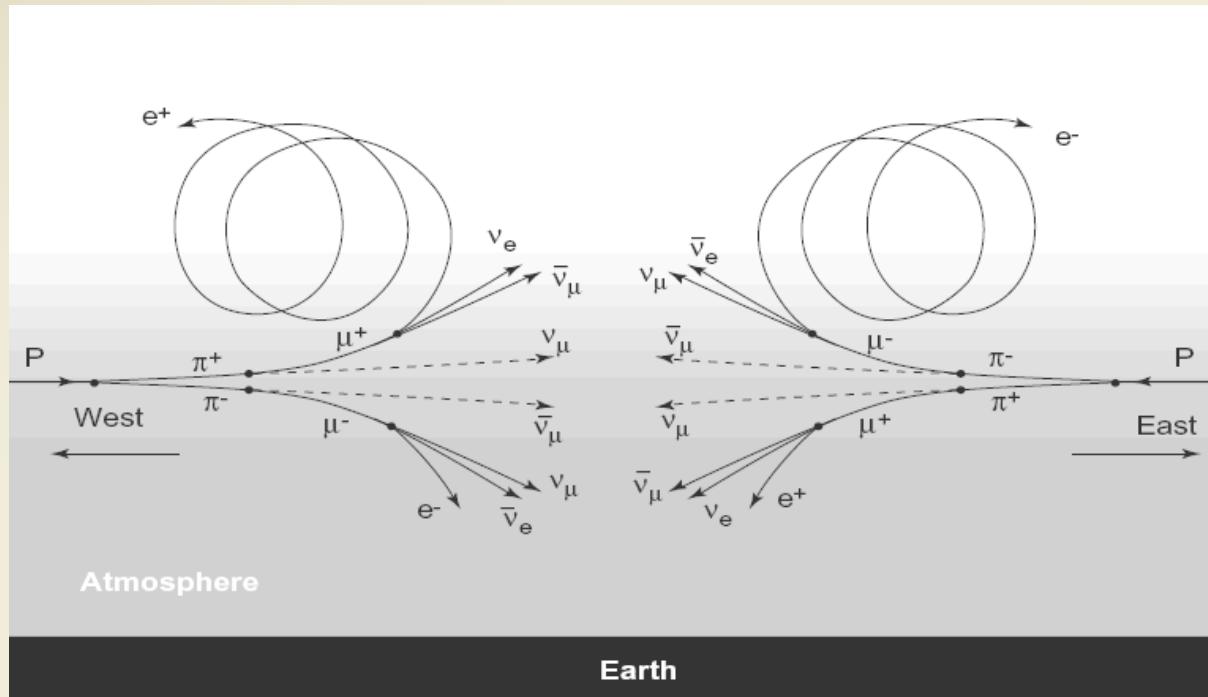


Conclusion

1. Electron and positron fluxes have a complex structure depending from energy, latitude and longitude.
2. New data might be useful to tune models of secondary production

Thank for your attention !

East-west asymmetry



¹Plyaskin, V. (2008), Mapping Earth's radiation belts using data from STS91 mission of AMS, *Astroparticle Physics*, 30, 18.